Weekly Review 5_0910

1) Evaluate each of the following limits algebraically and discuss the continuity of the function including any points of discontinuity.

   a) $\lim_{x\to 0} \frac{5x^3+8x^2}{3x^4-16x^2}$

   b) $\lim_{x\to 0}(cscx - cotx)$

2) Find $\frac{dy}{dx}$ and the slope of the tangent line at (2, 3).

   a) $x^2 + y^2 = 2y^3$

   b) $xy^2 - y^3 = x^2 - 5$

3) Find the equation of the line tangent to the graph of $y = \sqrt{x}$ at the point on the curve where the *y*-coordinate is exactly one-third the value of the *x*-coordinate given $x > 0$. Show the work that leads to your answer.

4) Find a value for *a* so that the function is continuous. Does this choice for *a* also make the function differentiable? If so, explain, if not, find a value for *a* that will make the function differentiable at all points.

$$f(x) = \begin{cases} 4 - x^2, & x < -1 \\ ax^2 - 1, & x \geq -1 \end{cases}$$

5) Use composition and the chain rule to show $\frac{dy}{dx} = 6tsin^2(t^2+5)\cos(t^2+5)$ if $y = [\sin(t^2+5)]^3$. This is an example where you may have three factors involved in the process.

Answers to Weekly Review 5

1)

a) $-\frac{1}{2}$

b) 0

2)

a) $\frac{dy}{dx} = \frac{2x}{6y^2-2y}$, $\left.\frac{dy}{dx}\right|_{(2,3)} = \frac{1}{12}$

b) $\frac{dy}{dx} = \frac{2x-y^2}{2xy-3y^2}$, $\left.\frac{dy}{dx}\right|_{(2,3)} = \frac{1}{3}$

3) Tangent line: $y = \frac{1}{6}(x-9) + 3$

4) When a = 4 the function is continuous, when a = -1 the derivatives would be equal, but because the function would not be continuous when a = -1, we can't talk about the function being differentiable at that point.

5) Answers will vary